# APPENDIX A

A substantial portion of this glossary is derived from the official glossary published by the Association of Firearms and Toolmark Examiners (AFTE) and used by its members to enhance uniformity in terminology.

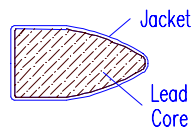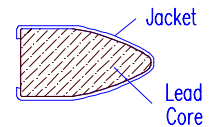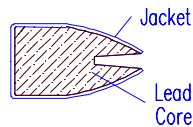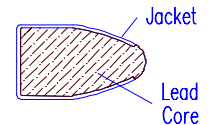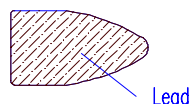| TERM | Definition |
| --- | --- |
| **Ballistics, Interior** | The study of the motion of the projectile(s) within the firearm from the moment of ignition until it leaves the barrel. |
| **Breech** | The part of a firearm at the rear of the bore into which the cartridge or propellant is inserted. |
| **Breech Face** | That part of the breechblock or breech bolt which is against the head of the cartridge case or shotshell during firing. |
| **Breech Face Markings** | Negative impression of the breech face of the firearm found on the head of the cartridge case after firing. |

**Bullet Types**

Total Metal Jacket (TMJ)
Jacket
Lead Core

Full Metal Case (FMC)
Jacket
Lead Core

Jacketed Hollow Point (JHP)
Jacket
Lead Core

Jacketed Soft Point (JSP)
Jacket
Lead Core

Lead
Lead

Cast Lead
Lead
Grease Groove
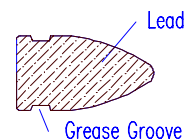
| TERM | Definition |
|---|---|
| **Bullet, Cast** | A bullet formed by pouring molten lead into a mold. |
| **Bullet, Copper Jacketed** | A bullet having an outer jacket of copper or copper alloy and containing a lead alloy core. |
| **Bullet Engraving** | The rifling impressions on a fired bullet. |
| **Bullet, Full Metal Jacket** | A projectile in which the bullet jacket encloses the core, usually with the exception of the base.  Also called FULL JACKETED, FULL PATCH,  and FULL METAL CASE. |
| **Bullet, Hollow Point** | A bullet with a cavity in the nose to facilitate expansion. |
| **Bullet, Jacketed** | See BULLET, COPPER JACKETED. |
| **Caliber** | 1.  Firearms:  The approximate diameter of the circle formed by the tops of the lands of a rifled barrel.<br><br>2.  Ammunition:  A numerical term, without the decimal point, included in a cartridge name to indicate a rough approximation of the bullet diameter. |
| **Cartridge** | A single unit of ammunition consisting of the case, primer and propellant with or without one or more projectiles.  Also applies to a shotshell. |
| **Cartridge Case** | The container for all the other components which comprise a cartridge. |
| **Cartridge Case Head** | The base of the cartridge case which contains the primer. |
| **Chamber** | The rear part of the barrel bore that has been formed to accept a specific cartridge.  Revolver cylinders are multi-chambered. |
| **Chamber Marks** | Individual  microscopic marks placed upon a cartridge case by the chamber wall as a result of any or all of the following:  1) chambering, 2) expansion during firing, 3) extraction. |

| **TERM** | **Definition** |
|---|---|
| **Class Characteristics** | Measurable features of a specimen which indicate a restricted group source.  They result from design factors, and are therefore determined prior to manufacture. |
| **Comparison Microscope** | Essentially two microscopes connected to an optical bridge which allows the viewer to observe two objects simultaneously with the same degree of magnification.  This instrument can have a monocular or binocular eyepiece.  Sometimes referred to as COMPARISON MACROSCOPE. |
| **DAS** | Terminology used by Forensic Technology Inc. to describe the Data Acquisition Station.  This station consists of a customized microscope with two built in cameras (one for bullets an done for cartridge cases), a lower monitor for demographic data entry and review and an upper monitor for acquisition and display of the evidence. |
| **Ejector** | A portion of a firearm's mechanism which ejects or expels cartridges or cartridge cases from a firearm. |
| **Ejector Marks** | Toolmarks produced upon a cartridge or cartridge case on the head, generally at or near the rim, from contact with the ejector. |
| **Extractor** | A mechanism for withdrawing the cartridge or cartridge case from the chamber. |



| | |
|---|---|
| **Extractor Mark** | Toolmarks produced upon a cartridge or cartridge case from contact with the extractor.  These are usually found on or just ahead of the rim. |
| **Firearms Identification** | Firearms identification is a discipline of forensic science which has as its primary concern to determine if a bullet, cartridge case or other ammunition component was fired by a particular firearm. |
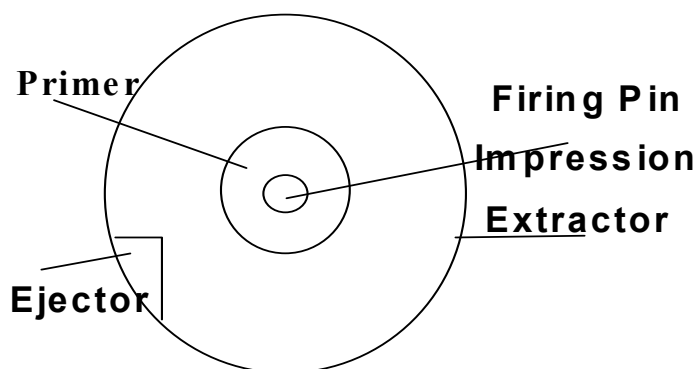
**GLOSSARY**  (contd.)

| TERM | Definition |
|------|-----------|
| **Firing Pin Drag Marks** | The toolmarks produced when a projecting firing pin comes into contact with a cartridge case or shot shell during the extraction, ejection cycle. |
| **Firing Pin Impression** | The indentation in the primer of a centerfire cartridge case or in the rim of a rimfire cartridge case caused when it is struck by the firing pin. |
| **IBIS** | Integrated Ballistics Identification System.  The term used by Forensic Technology Inc. to describe the combination of of the SAS and DAS system which has both bullet and cartridge case imaging capapbilites |
| **Individual Characteristics** | Imperfections or irregularities produced accidentally during manufacture or caused by use, abuse, corrosion, rust, or damage to an object.  They are unique to that object and distinguish it from all other objects.  Also called ACCIDENTAL CHARACTERISTICS. |
| **Microscopic Marks** | Striae or patterns of minute lines or grooves in an object.  In firearm and toolmark identification these marks are characteristic of the object which produced them and are the basis for identification. |
| **Primer** | The ignition component of a cartridge. |
| **Primer, Centerfire** | A cartridge initiator which is assembled central to the axis of the head of the cartridge case and which is actuated by a blow to the center of its axis as opposed to rimfire which must be struck on the circumference. |
| **Primer Cratering** | A circumferential rearward flow of metal surrounding the indentation of a firing pin in a primer cup. |
| **Primer Cup** | Brass or copper cup designed to contain priming mixture. |
| **RBI™** | Rapid Brass Identification System, a system used by Forensic Technologies to capture cartridge cases images using a portable image acquisition station.  This includes a laptop computer and a microscope. The images are transmitted to an IBIS™ station for correlation and analysis. |

**GLOSSARY** (contd.)

| TERM | Definition |
|---|---|
| **RDAS** | A DAS station at a remote site from the hub. It includes the main analysis and limited correlation features of the SAS and is connected to the hub via a WAN connection. The RDAS performs all acquisitions procedures but can only display correlation based on its own local database or correlations generated by the hub. |
| **SAS™** | Terminology used by Forensic Technology Inc. to describe the Signature Analysis Station. Evidence from the DAS or Remote DAS is replicated and copied to the SAS and correlated. The lower monitor allows one to select and analyze evidence. The upper monitor allows one to compare images side-by-side or overlapped |
| **Shotshell** | A cartridge containing projectile(s) designed to be fired in a shotgun. The cartridge body may be metal, plastic or paper. |
| **Striations** | Parallel surface contour variations on the surface of an object caused by a combination of force and motion where the motion is approximately parallel to the plane being marked. These striations are accidental in nature and unique to a common origin (a particular firearm or tool). Also called STRIAE. |
| **Sub Class Characteristics** | Discernable surface features on an object which are more restrictive than Class Characteristics in that they are: <br> 1. Produced incidental to manufacture <br> 2. Are significant in that they relate to a smaller group source <br> 3. Can arise from a source which changes over time |
| **Test Cartridge Case** | A cartridge case obtained while test firing a firearm in a laboratory to be used for comparison or analysis. |

# APPENDIX B

## PERFORMANCE TESTS IN SUPPORT OF PENAL CODE 12072.5 (AB1717)

AB1717 requires that the Department of Justice conduct a study to test the feasibility of a state wide database that would containing ballistics images of all new handguns sold in California. It is assumed that this database will be limited to cartridge case images only. Bullets images from newly fired handguns have inherent problems and their current hit rate is very low in comparison to cartridge case images.

The assumption is that the database will be limited to cartridge cases from semiautomatic handguns from calibers .25 Auto to .45 Auto. .22 LR rim fire cartridge case breech face marks are generally not amenable to database imaging for subsequent correlation. Given these limitations, it is assumed that 200,000 handguns will require a cartridge case image each year. Thus in five years, this database could have 1,000,000 cartridge case images.

There are no known databases that approach a size of 200,000 handguns in the aforementioned category. As a consequence, the proposed tests to be conducted cannot truly simulate such a large database. These tests are a limited attempt to determine the feasibility of such a large database. If the correlation system for cartridge case comparison exhibits impairment or shows reduced performance in our limited database then one can be postulate that it would apply to a larger database in a proportionate amount. However, satisfactory completion of these performance tests in this limited database is no guarantee that the specimens will perform in a database that will have 1,000,000 images in five years. The sheer size of this proposed database dwarfs the current forensic databases that number from 1,000 to 12,000 in California.

These tests are meant to look at variability that can affect a cartridge case image and postulate how that variable will affect a large database.

Federal Ammunition was selected because it was the only type that could be obtained in the initial short time frame that had sufficient rounds that were all from one lot. The source of ammunition used for the study was the Federal .40 S&W 180 grain Hi-Shok® Jacketed Hollow Point, Lot# 420322X269.

**Performance Test #1:** System Correlation

**Purpose:**  To develop a large database with semi-automatic pistol cartridge case images from one manufacture, caliber and model.

**Equipment/Supplies:**
- 1,000 .40 caliber, Smith & Wesson Model 4006 semiautomatic handguns from the California Highway Patrol.
- Federal .40 S & W 180 grain Hi-Shok® Jacketed Hollow Point, Lot# 420322X269
- 200 hours of specimen entry time

**Test Conditions:**
- All cartridges from one manufacture's lot
- Test fire two cartridges in each handgun
- Enter both cartridge cases into IBIS
- One as test fire – Cartridge A
- One as evidence – Cartridge B
- Keep an arbitrary 10 cartridge cases from the first 100 test fired for correlation every hundred cartridge cases
- Correlate all 1000 cartridge cases after all are entered (note: test fire will not correlate against each other)

**Evaluation:**
- Time required to enter cartridge cases
- Correlation position of the 1000 cartridge cases (changed to 50 because of time constraints)
- Correlation degradation as a function of database size
- Hard disk Storage requirements
- Correlation times as a function of database size?

**Performance Test #2:** Cartridge cases not in the data base


**Purpose:** To determine the ranking of ten cartridge cases fired by the same model that are <u>not</u> in the database of 1,000 cartridges against a database of 1,000 cartridge cases.

**Equipment/Supplies:**
- Ten fired .40 S&W cartridges from S&W Model 4006 handguns that are not in the database.
- Two hours of specimen entry time


**Test Conditions:**
- Ten fired cartridge cases from S&W .40 caliber handguns using the same ammunition as in **Performance Test** 1
- Enter into the database as tests fires
- Correlate the test to the 1,000 specimens

**Evaluation:**
- Ranking of these cartridge cases as known non-matching cartridge cases. A high ranking will cause unproductive comparison times

**Performance Test #3**: Ammunition Effect on Correlation


**Purpose:** To determine the effect of ammunition change on the correlation of previously fired cartridge cases.


**Equipment and Supplies:**
- 20 .40 caliber S & W Model 4006 semiautomatic handguns from the California Highway Patrol which have previously fired the **Performance Test #1** sequence.
- Ammunition from the following manufactures:
  - Winchester
  - Fiocchi
  - Precision Made Cartridges (El Dorado Cartridge Corp.)
  - Federal
  - CCI-Speer (Blount Inc.)

  Note: Due to availability and short notice, the following cartridge types were used for this test.
  - **El Dorado** - 40 S&W 180 grain JHP # C40SFA Lot # ELD40SFAQ38
  - **CORBON** – 40 S&W 165 grain JHP #COR4016, 1150FPS
  - **ARMASCOR** - 40 S&W 180 grain FMJ, Lot# 03093000
  - **Remington** - 40 S&W 180 grain JHP, #R40SW2C, lot # H29 NC2517
  - **Winchester** - 40 S&W 180 grain JHP, Sub Sonic #RA40180HP, Lot# RC41


**Test Conditions:**
- Test fire the .40 caliber handguns with the ammunition at the initial time of testing firing Performance Test # 1
- Wait until the database is at 1,000 cartridge cases and run a correlation for each of the different fired cartridge cases


**Evaluation:**
- What is the correlation of the cartridge made by different vendors in comparison to the correlation of the cartridges in Performance Test #1?

**Performance Test #4**:  Altered Breech Face


**Purpose:**  To illustrate correlation differences with minimal change to the firing pin and the breech face surfaces made with minimum file or sandpaper efforts.


**Equipment and Supplies**:
- One pistol slide from the series of 1,000 .40 caliber Smith & Wesson Model 4006 semiautomatic handguns from the California Highway Patrol.
- File and sandpaper


**Test Conditions:**
- Take one .40 caliber S&W slide previously test fired for Performance Test #1 and change the firing pin surface.
- Test fire two cartridges using the same ammunition as used in Performance Test #1.
- Correlate this fired cartridge case to the 1,000 cartridges in the database.
- Take the same .40 caliber S&W slide and change the breech face.
- Test fire two cartridges using the same ammunition as used in Performance Test #1.
- Correlate this fired cartridge case to the 1,000 cartridge cases in the database.
- Option for progressive change?
- Document the skill level and time required to make this change.


**Evaluation:**
- To determine how easy it is to change the identifying characteristics of a cartridge case.

**Performance Test #5**:  Sig Sauer Correlation


**Purpose:**  To develop a medium size database with images of cartridge cases from one model of a handgun that is known to have minimal breech face characteristics

**Equipment and Supplies:**
- 500 Sig Sauers pistols from a local police agency.
- 1,000 cartridges from one manufacture's lot – Prefer Remington (Winchester has a harder primer)
- DAS at Sacramento County


**Test Conditions:**
- Test fire two cartridges in each handgun
- Enter both cartridge cases into IBIS
- One as evidence – Cartridge A
- One as test fire – Cartridge B
- Keep an arbitrary 10 of the first 100 for correlation every hundred cartridge cases
- Correlate all 1000 after all are entered (note; test fire cartridge cases will not correlate against each other)

**Evaluation:**
- What is the correlation of Sig Sauer compared to S&W fired cartridge cases?
- Is there a significant difference in ranking?
- Can this result be expended to other firearms with similar construction?

**Performance Test #6**:  Large Database Query


**Purpose:**  To have a major database, using IBIS technology, queried by its agency using a set of cartridge cases generated by DOJ.


**Equipment/Supplies:**
- Have New York Police Department query its database by for it's largest population of one caliber.
- Select firearms from different vendors in that same caliber range.
- Test fire the firearms using assorted ammunition brands.


**Test Conditions:**
- Determine the largest number of cartridge cases in one caliber in the database.
- Enter two submitted cartridge cases fired from five handguns supplied by CALDOJ, one as test, one as evidence.
- Correlate the cartridge cases.


**Evaluation:**
This test would evaluate performance of the correlation using an existing database that is somewhat larger than the current database used to conduct the Performance Tests.

**Performance Test #7**:  Breech Face Longevity


**Purpose**:  What is the effect on the breech face impression after multiple shots have been fired?

**Equipment and Supplies:**
- Sig Sauer and S&W pistols fired 600 times, .40 caliber preferred.
- Use one lot of ammunition.
- Use Senate Bill 15 certified firearm testing laboratories.


**Test Conditions**:
- Fire 600 cartridges in each handgun
- Save every 10$^{th}$ cartridge case in an envelope
- Enter Test 1 as evidence
- Enter Test 2 as test and correlate
- Enter every 50$^{th}$ round as a test cartridge case and correlate.
- Change correlation to every 25 rounds if more data points are needed


**Evaluation:**
- To what degree, if any, does the correlation change between Test fire 1 and 2 and subsequent test fires?  This data may be amenable as a plot-illustrating decline in correlation as a function of number fired.

**Performance Test #8**: Sub-class Feature Effects on Breechface Marks

**Purpose:** To evaluate the effect on correlation of cartridge cases by firearms known to have sub-class characteristics.

**Equipment and Supplies**:
- Select firearms with known sub-class features such as Heckler & Koch, United Sporting Arms (El Dorado), or Lorcin.

**Test Conditions:**
- Enter into a database as many fired cartridge cases from these manufacturers.
- Compare their correlation within a manufacturer series.
- Could utilize a large database and separate out just the firearms of one type and correlation these to look for a high rate of false hits.
- Ideally, in order to collect the proper samples, one would need to be at the source of the manufacturer of the firearm in order to collect cartridge case samples from consecutive firearms.
-

**Evaluation:**
- Does the presence of significant sub-class features that carry over from one gun to another mask the detail of the individual characteristics when they are correlated?

**APPENDIX C**

**PERFORMANCE TESTS NUMERICAL RESULTS – RAW DATA**

The performance tests were conducted on an IBIS system located at the headquarters of Forensic Technology Inc. (FTI) in Montreal, Canada. Prior to the tests, the test database of 792 cartridges fired from the CHP 40 caliber Smith & Wesson Model 4006 pistols, was sent to FTI along with 50 randomly selected evidence cartridge cases using the same ammunition. FTI was asked to enter the 792 Federal cartridge cases as "test specimens" and then correlate the 50 Federal cartridges cases as "evidence specimens". At a later date, members of the DOJ technical group, Laboratory Director Fred Tulleners (CALDOJ) and Criminalist Leslie Poole (Sacramento County), arrived with the remaining "evidence cartridge cases" and proceeded to conduct a series of tests of the entire database and its various submissions. They were assisted in this task by Mike McClain (FTI) and Rene Belanger, Vice President (FTI). It is the belief of Lab Director Tulleners and Criminalist Poole that the initial data entry and subsequent tests were conducted in an objective and unbiased manner.

The database of 792 cartridge cases and 50 random samples were received by FTI in three shipments during the week of April 16 – 20, 2001. The tests were conducted by FTI and the results monitored by the CAL DOJ representatives during the period of April 23-25, 2001. CAL DOJ entered the results in duplicate, by typing into a computer Excel spreadsheet. Both DOJ staff subsequently verified the data. After verification, the results (both raw and complete) were given to FTI. Upon completion of the entire test, all information about the database (Evidence and CA numbers) were given to FTI.

The entries that were recorded consisted of the evidence specimen number (Exx), its apparent matching cartridge case in the database (CAxx) for both the firing pin and the breech face correlation. In case the match was not correct, the location in the database of the true matching or twin cartridge case was also noted. The system was set up so that it could only rank to position 160. Thus a cartridge case whose true rank in the database may have been 170 would be described "Not in the List".

The spreadsheets in this section reflect the raw data for Performance Tests 1, 1B, 1C, 2, 3 4, and 7. This section also has an example of an "IBIS Correlation Result" print out.

# Correlation of 50 Random Cartridge Cases - Test 1

| Evidence Number | CA Number | Item Description | Cartridge Manufacture | DATABASE SIZE E1-E792 Test 1 Test Type | Breech Score in 40 S&W DB | Breech Match To | Breech Actual Rank in 40 S&W DB | FP Score in 40 S&W DB | FP Match To | FP Actual Rank in 40 S&W DB |
|---|---|---|---|---|---|---|---|---|---|---|
| E1 | CA043 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 75 | 52 | 4 | 77 | 43 | 1 |
| E2 | CA457 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 81 | 471 | 36 | 97 | 471 | 105? |
| E3 | CA471 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 50 | 597 | 2 | 121 | 380 | 83 |
| E4 | CA221 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 30 | 502 | 121 | 83 | 85 | 7 |
| E5 | CA225 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 28 | 241 | 113 | 80 | 509 | 77 |
| E6 | CA279 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 49 | 726 | 62 | 105 | 565 | 47 |
| E7 | CA678 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 86 | 38 | 78 | 96 | 678 | 1 |
| E8 | CA027 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 63 | 707 | 30 | 85 | 535 | 140 |
| E9 | CA532 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 41 | 764 | 116 | 103 | 502 | 88 |
| E10 | CA022 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 41 | 304 | Not in Selection | 106 | 502 | Not in Selection |
| E11 | CA645 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 45 | 356 | 122 | 57 | 645 | 1 |
| E12 | CA237 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 39 | 269 | 6 | 118 | 72 | 10 |
| E13 | CA677 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 37 | 677 | 1 | 88 | 546 | 7 |
| E14 | CA698 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 52 | 65 | 90 | 93 | 698 | 1 |
| E15 | CA481 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 55 | 470 | 58 | 95 | 393 | 9 |
| E16 | CA201 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 60 | 201 | 1 | 99 | 631 | 49 |
| E17 | CA256 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 94 | 256 | 1 | 92 | 512 | 9 |
| E18 | CA669 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 75 | 669 | 1 | 74 | 658 | 68 |
| E19 | CA100 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 51 | 694 | 138 | 71 | 509 | 40 |
| E20 | CA098 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 42 | 98 | 1 | 36 | 522 | 4 |
| E21 | CA404 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 50 | 694 | 13 | 91 | 404 | 1 |
| E22 | CA560 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 55 | 414 | Not in Selection | 97 | 393 | Not in Selection |
| E23 | CA612 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 78 | 501 | 3 | 90 | 632 | 3 |
| E24 | CA193 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 51 | 70 | 80 | 99 | 193 | 1 |
| E25 | CA127 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 31 | 502 | 118 | 72 | 127 | 1 |
| E26 | CA244 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 83 | 244 | 1 | 109 | 393 | 7 |
| E27 | CA473 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 49 | 269 | Not in Selection | 87 | 62 | Not in Selection |
| E28 | CA258 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 64 | 258 | 1 | 85 | 504 | 63 |
| E29 | CA368 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 37 | 368 | 1 | 90 | 380 | 131 |
| E30 | CA070 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 36 | 269 | 45 | 103 | 179 | 111 |
| E31 | CA218 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 53 | 734 | 90 | 101 | 509 | 131 |
| E32 | CA040 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 81 | 609 | 109 | 188 | 40 | 1 |
| E33 | CA335 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 57 | 502 | 73 | 101 | 509 | 122 |

# Correlation of 50 Random Cartridge Cases - Test 1

| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 1 Test Type | Score in 40 S&W DB | Match To | Actual Rank in 40 S&W DB | Score in 40 S&W DB | Match To | Actual Rank in 40 S&W DB |
|---|---|---|---|---|---|---|---|---|---|---|
| E34 | CA266 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 59 | 501 | Not in Selection | 87 | 509 | Not in Selection |
| E35 | CA566 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 56 | 502 | Not in Selection | 105 | 393 | Not in Selection |
| E36 | CA226 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 56 | 226 | 1 | 131 | 393 | 115 |
| E37 | CA565 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 41 | 26 | 2 | 96 | 154 | 23 |
| E38 | CA117 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 80 | 117 | 1 | 88 | 117 | 1 |
| E39 | CA710 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 45 | 694 | Not in Selection | 93 | 692 | Not in Selection |
| E40 | CA084 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 30 | 602 | 131 | 95 | 84 | 1 |
| E41 | CA048 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 56 | 545 | 80 | 87 | 168 | 27 |
| E42 | CA188 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 79 | 188 | 1 | 112 | 535 | 2 |
| E43 | CA703 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 38 | 609 | Not in Selection | 94 | 398 | Not in Selection |
| E44 | CA058 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 60 | 663 | 45 | 92 | 58 | 1 |
| E45 | CA674 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 69 | 481 | 145 | 98 | 674 | 1 |
| E46 | CA426 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 54 | 13 | Not in Selection | 87 | 440 | Not in Selection |
| E47 | CA231 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 40 | 608 | 2 | 107 | 393 | 45 |
| E48 | CA275 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 65 | 275 | 1 | 95 | 563 | 45 |
| E49 | CA038 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 51 | 694 | Not in Selection | 82 | 630 | Not in Selection |
| E50 | CA180 | Cartridge | Federal | Distribution of 50 Random Cartridge Cases | 31 | 180 | 1 | 119 | 180 | 1 |

# Correlation of 50 Random Cartridge Cases - Test 1

| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 1 Test Type | Score in 40 S&W DB | Match To | Actual Rank in 40 S&W DB | Score in 40 S&W DB | Match To | Actual Rank in 40 S&W DB |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| NOTE: | 160 Specimens were stored in the selection set.  Thus any specimen with a rank >160 is not numbered | | | | | | | | | |
| | Evaluation  per Monitor Display | | | | | | | | | |
| | E34 - FP has detail BF smooth | | | | | | | | | |
| | E35-FP Smooth BF Smooth | | | | | | | | | |
| | E39 - BF not much  FP some | | | | | | | | | |
| | E43-BF Smooth FP Nothing | | | | | | | | | |
| | E46- BF Smooth FP Difficult | | | | | | | | | |
| | E49 BF Smooth  FP some Detail | | | | | | | | | |

# Correlation Time Versus Database Size - Test 1B

| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 1B — Test Type | DB Size | Time Seconds | |
|---|---|---|---|---|---|---|---|
| E-8 | 27 | Cartridge | Federal | Time to correlate as a function of DB size | 100 | 29 | 28* |
| E-8 | 27 | Cartridge | Federal | Time to correlate as a function of DB size | 250 | 40 | |
| E-8 | 27 | Cartridge | Federal | Time to correlate as a function of DB size | 500 | 43 | |
| E-8 | 27 | Cartridge | Federal | Time to correlate as a function of DB size | 792 | 49 | |
| E-2 | 457 | Cartridge | Federal | Time to correlate as a function of DB size | 100 | 33 | |
| E-2 | 457 | Cartridge | Federal | Time to correlate as a function of DB size | 250 | 40 | |
| E-2 | 457 | Cartridge | Federal | Time to correlate as a function of DB size | 500 | 47 | |
| E-2 | 457 | Cartridge | Federal | Time to correlate as a function of DB size | 792 | 51 | |
| E-30 | 70 | Cartridge | Federal | Time to correlate as a function of DB size | 100 | 29 | |
| E-30 | 70 | Cartridge | Federal | Time to correlate as a function of DB size | 250 | 43 | |
| E-30 | 70 | Cartridge | Federal | Time to correlate as a function of DB size | 500 | 48 | |
| E-30 | 70 | Cartridge | Federal | Time to correlate as a function of DB size | 792 | 51 | |
| E44 | 58 | Cartridge | Federal | Time to correlate as a function of DB size | 100 | Not done - no need | |
| E44 | 58 | Cartridge | Federal | Time to correlate as a function of DB size | 250 | Not done - no need | |
| E44 | 58 | Cartridge | Federal | Time to correlate as a function of DB size | 500 | Not done - no need | |
| E44 | 58 | Cartridge | Federal | Time to correlate as a function of DB size | 750 | Not done - no need | |
| | | | | | | | |
| | | *=28 is any 100, 29 is CA01-100 | | | | | |
| | | | | | | | |
| | | Note: 1. Correlation of the DB not in any order of CA | | | | | |
| | | Note: 2. Correlation of the first 100 correlates all samples after that it correlates the top 20% | | | | | |
| | | Note:3 Used a LINUX based development Server (1-Compaq and 4 Industrial Computers) | | | | | |

# Correlation Position versus Database Size - Test 1C

| Evidence Number | Evidence Evidence | CA Number | Item Description | Cartridge Manufacture | Test 1B Test Type | Position at 100 | Position at 200 | Position at 300 | Position at 400 | Position at 500 | Position at 600 | Position at 700 | Position at 792 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E149A | E-2 | 457 | Cartridge | Federal | Position | 21 | Not in List | Not in List | 44 | 55 | 62 | 71 | 79 |
| E150A | E-8 | 27 | Cartridge | Federal | Position | Not in List | Not in List | Not in List | | | | | Not in List |
| E151A | E-30 | 70 | Cartridge | Federal | Position | 7 | 7 | 8 | 11 | 17 | 19 | 26 | 24 |
| E152A | E-44 | 58 | Cartridge | Federal | Position | 1 | Not in List | | Not in List | | | Not in List | Not in List |
| E153A | E-21 | 404 | Cartridge | Federal | Position | 5 | 5 | 6 | 10 | 11 | 12 | 15 | 15 |
| None | E-8 | 27 | Cartridge | Federal | Position | 7 | 6 | 8 | 8 | 11 | 17 | 27 | 30 |
| None | E-12 | 237 | Cartridge | Federal | Position | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 6 |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | | | | | | | | | | | | | |
| | Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 1B Test Type | Position at 100 | Position at 200 | Position at 300 | Position at 400 | Position at 500 | Position at 600 | Position at 700 | Position at 792 |
| E149A | E-2 | 457 | Cartridge | Federal | Position | 27 | Not in List | Not in List | 61 | 83 | 96 | 120 | 132 |
| E150A | E-8 | 27 | Cartridge | Federal | Position | Not in List | Not in List | | | | | | Not in List |
| E151A | E-30 | 70 | Cartridge | Federal | Position | 14 | 21 | 31 | 42 | 53 | 54 | 81 | 87 |
| E152A | E-44 | 58 | Cartridge | Federal | Position | 20 | Not in List | | Not in List | | | Not in List | Not in List |
| E153A | E-21 | 404 | Cartridge | Federal | Position | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| None | E-8 | 27 | Cartridge | Federal | Position | 37 | 35 | 53 | 65 | 90 | 115 | 123 | 140 |
| None | E-12 | 237 | Cartridge | Federal | Position | 2 | 3 | 4 | 5 | 6 | 7 | 7 | 11 |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | E- | | Cartridge | Federal | Position | | | | | | | | |
| | | | | | | | | | | | | | |
| | Note: 1 | E149A to E153A are prior evidence samples (as listed) imaged again by Criminalist Leslie Poole | | | | | | | | | | | | |
| | Note: 2 | Not in the list of the first 160 specimens | | | | | | | | | | | | |

# Firearms Not in the Database - Test 2

| Evidence Number | CHP Control # | CA Number | Item Description | Cartridge Manufacture | DATABASE SIZE E1-E792 Test 2 Test Type | Breech Score in 40 S&W DB | Breech Match To | Comments |
|---|---|---|---|---|---|---|---|---|
| E139 | B0089 | None | Cartridge | Federal | Firearms not in the Database | 39 | 471 | |
| E140 | B0072 | None | Cartridge | Federal | Firearms not in the Database | 33 | 525 | |
| E141 | B0905 | None | Cartridge | Federal | Firearms not in the Database | 36 | 502 | |
| E142 | B0982 | None | Cartridge | Federal | Firearms not in the Database | 41 | 9 | |
| E143 | B0370 | None | Cartridge | Federal | Firearms not in the Database | 49 | 604 | |
| E144 | B0056 | None | Cartridge | Federal | Firearms not in the Database | 35 | 492 | |
| E145 | B1484 | None | Cartridge | Federal | Firearms not in the Database | 26 | 269 | |
| E146 | B1353 | None | Cartridge | Federal | Firearms not in the Database | 43 | 532 | |
| E147 | B0839 | None | Cartridge | Federal | Firearms not in the Database | 51 | 419 | Next highest score was 48 |
| E148 | B0320 | None | Cartridge | Federal | Firearms not in the Database | 50 | 335 | |
| | | | | | | | | |
| | | | | | | | | |
| Evidence Number | CHP Control # | CA Number | Item Description | Cartridge Manufacture | Test 2 Test Type | Firing Pin Score in 40 S&W DB | Firing Pin Match To | Comments |
| E139 | B0089 | None | Cartridge | Federal | Firearms not in the Database | 78 | 138 | |
| E140 | B0072 | None | Cartridge | Federal | Firearms not in the Database | 116 | 393 | |
| E141 | B0905 | None | Cartridge | Federal | Firearms not in the Database | 83 | 152 | |
| E142 | B0982 | None | Cartridge | Federal | Firearms not in the Database | 82 | 513 | |
| E143 | B0370 | None | Cartridge | Federal | Firearms not in the Database | 91 | 655 | |
| E144 | B0056 | None | Cartridge | Federal | Firearms not in the Database | 96 | 535 | |
| E145 | B1484 | None | Cartridge | Federal | Firearms not in the Database | 107 | 589 | |
| E146 | B1353 | None | Cartridge | Federal | Firearms not in the Database | 121 | 393 | Next highest score = 116 |
| E147 | B0839 | None | Cartridge | Federal | Firearms not in the Database | 94 | 667 | |
| E148 | B0320 | None | Cartridge | Federal | Firearms not in the Database | 93 | 367 | |
| | | | | | | | | |
| | | | | Note: | Criminalist Leslie Poole Entered E139-148 into the system 4/23/01 | | | |

# Ammunition Effect on Correlation - Test 3

| Evidence Number | CA Number | Item Descrip. | Cartridge Manufacture | Test 3 Test Type | Breech Score in 40 S&W DB | Breech Match To | Breech Act. Rank in 40 S&W DB | Firing Pin Score in 40 S&W DB | Firing Pin Match To | Firing Pin Act. Rank in 40 S&W DB |
|---|---|---|---|---|---|---|---|---|---|---|
| E51 | 143 | Cartridge | Winchester | Ammunition Effect on Correlat | 31 | 143 | 1 | 55 | 143 | 1 |
| E52 | 170 | Cartridge | Winchester | Ammunition Effect on Correlat | 34 | 170 | 1 | 106 | 147 | 3 |
| E53 | 358 | Cartridge | Winchester | Ammunition Effect on Correlat | 35 | 643 | Not in List | 80 | 393 | Not in List |
| E54 | 362 | Cartridge | Winchester | Ammunition Effect on Correlat | 54 | 362 | 1 | 55 | 346 | 3 |
| E55 | 393 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 45 | 471 | Not in List | 80 | 405 | Not in List |
| E56 | 409 | Cartridge | Corbon | Ammunition Effect on Correlat | 45 | 577 | Not in List | 87 | 709 | Not in List |
| E57 | 412 | Cartridge | Eldorado | Ammunition Effect on Correlat | 32 | 615 | 49 | 94 | 502 | 79 |
| E58 | 435 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 37 | 514 | Not in List | 81 | 514 | Not in List |
| E59 | 439 | Cartridge | Winchester | Ammunition Effect on Correlat | 29 | 439 | 1 | 86 | 630 | 50 |
| E60 | 444 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 25 | 351 | 123 | 68 | 168 | 24 |
| E61 | 448 | Cartridge | Corbon | Ammunition Effect on Correlat | 29 | 453 | Not in List | 88 | 656 | Not in List |
| E62 | 475 | Cartridge | Eldorado | Ammunition Effect on Correlat | 25 | 502 | Not in List | 92 | 496 | Not in List |
| E63 | 480 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 32 | 531 | 56 | 98 | 630 | 92 |
| E64 | 499 | Cartridge | Winchester | Ammunition Effect on Correlat | 32 | 501 | Not in List | 111 | 393 | Not in List |
| E65 | 501 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 32 | 778 | 73 | 65 | 207 | 52 |
| E66 | 511 | Cartridge | Corbon | Ammunition Effect on Correlat | 20 | 704 | Not in List | 42 | 656 | Not in List |
| E67 | 512 | Cartridge | Eldorado | Ammunition Effect on Correlat | 42 | 512 | 1 | 113 | 315 | 13 |
| E68 | 524 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 39 | 335 | 56 | 84 | 517 | 134 |
| E69 | 530 | Cartridge | Winchester | Ammunition Effect on Correlat | 28 | 704 | 51 | 103 | 630 | 27 |
| E70 | 546 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 31 | 471 | 135 | 102 | 517 | 72 |
| E71 | 571 | Cartridge | Eldorado | Ammunition Effect on Correlat | 18 | 464 | 119 | 87 | 614 | 62 |
| E72 | 571 | Cartridge | Winchester | Ammunition Effect on Correlat | 39 | 566 | Not in List | 94 | 393 | Not in List |
| E73 | 603 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 23 | 471 | Not in List | 76 | 498 | Not in List |
| E74 | 648 | Cartridge | Corbon | Ammunition Effect on Correlat | 25 | 786 | Not in List | 69 | 709 | Not in List |
| E75 | 725 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 28 | 473 | 139 | 39 | 725 | 1 |
| E76 | 725 | Cartridge | Winchester | Ammunition Effect on Correlat | 23 | 244 | 103 | 42 | 485 | 86 |
| E77 | 730 | Cartridge | Eldorado | Ammunition Effect on Correlat | 15 | 76 | 49 | 63 | 653 | 3 |
| E78 | 735 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 39 | 451 | 101 | 69 | 171 | 49 |
| E79 | 524 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 32 | 778 | 27 | 67 | 656 | 81 |
| E80 | 530 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 22 | 56 | Not in List | 95 | 393 | Not in List |
| E81 | 511 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 29 | 351 | 125 | 74 | 393 | 14 |
| E82 | 512 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 33 | 547 | Not in List | 73 | 433 | Not in List |
| E83 | 475 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 43 | 336 | Not in List | 70 | 496 | Not in List |
| E84 | 499 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 26 | 549 | 146 | 69 | 655 | 20 |

# Ammunition Effect on Correlation - Test 3

| Evidence Number | CA Number | Item Descrip. | Cartridge Manufacture | Test 3 Test Type | Score in 40 S&W DB | Match To | Act. Rank in 40 S&W DB | Score in 40 S&W DB | Match To | Act. Rank in 40 S&W DB |
|---|---|---|---|---|---|---|---|---|---|---|
| E85 | 501 | Cartridge | Winchester | Ammunition Effect on Correlat | 22 | 790 | 13 | 50 | 265 | 28 |
| E86 | 205 | Cartridge | Winchester | Ammunition Effect on Correlat | 37 | 205 | 1 | 52 | 509 | 61 |
| E87 | 393 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 34 | 704 | 108 | 76 | 513 | 56 |
| E88 | 409 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 29 | 458 | 69 | 105 | 535 | 2 |
| E89 | 444 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 21 | 451 | 14 | 83 | 581 | 17 |
| E90 | 448 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 42 | 448 | 1 | 84 | 62 | 133 |
| E91 | 448 | Cartridge | Winchester | Ammunition Effect on Correlat | 32 | 448 | 1 | 106 | 393 | 12 |
| E92 | 499 | Cartridge | Eldorado | Ammunition Effect on Correlat | 25 | 591 | Not in List | 116 | 393 | Not in List |
| E93 | 530 | Cartridge | Eldorado | Ammunition Effect on Correlat | 32 | 530 | 1 | 112 | 630 | 35 |
| E94 | 546 | Cartridge | Eldorado | Ammunition Effect on Correlat | 26 | 546 | 1 | 100 | 726 | 8 |
| E95 | 648 | Cartridge | Eldorado | Ammunition Effect on Correlat | 18 | 119 | Not in List | 78 | 179 | Not in List |
| E96 | 730 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 35 | 314 | 86 | 93 | 730 | 1 |
| E97 | 725 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 23 | 643 | 132 | 82 | 687 | 2 |
| E98 | 435 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 38 | 180 | Not in List | 82 | 515 | Not in List |
| E99 | 448 | Cartridge | Eldorado | Ammunition Effect on Correlat | 23 | 505 | 9 | 102 | 448 | 1 |
| E100 | 480 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 34 | 169 | 88 | 104 | 517 | 105 |
| E101 | 501 | Cartridge | Corbon | Ammunition Effect on Correlat | 28 | 266 | 13 | 70 | 632 | 38 |
| E102 | 501 | Cartridge | Eldorado | Ammunition Effect on Correlat | 20 | 698 | 5 | 104 | 315 | 7 |
| E103 | 530 | Cartridge | Corbon | Ammunition Effect on Correlat | 29 | 460 | 45 | 83 | 656 | 70 |
| E104 | 546 | Cartridge | Winchester | Ammunition Effect on Correlat | 23 | 455 | 30 | 106 | 589 | 49 |
| E105 | 571 | Cartridge | Corbon | Ammunition Effect on Correlat | 28 | 266 | 149 | 63 | 656 | 80 |
| E106 | 603 | Cartridge | ACP-Armscor | Ammunition Effect on Correlat | 23 | 549 | Not in List | 59 | 656 | Not in List |
| E107 | 648 | Cartridge | Winchester | Ammunition Effect on Correlat | 24 | 89 | Not in List | 71 | 142 | Not in List |
| E108 | 725 | Cartridge | Eldorado | Ammunition Effect on Correlat | 23 | 365 | 163 | 125 | 725 | 1 |
| E109 | 603 | Cartridge | Winchester | Ammunition Effect on Correlat | 25 | 507 | 119 | 86 | 393 | 4 |
| E110 | 480 | Cartridge | Corbon | Ammunition Effect on Correlat | 30 | 523 | 44 | 51 | 562 | 18 |
| E111 | 475 | Cartridge | Winchester | Ammunition Effect on Correlat | 20 | 704 | 113 | 96 | 393 | 14 |
| E112 | 501 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 26 | 505 | 64 | 77 | 425 | 29 |
| E113 | 444 | Cartridge | Eldorado | Ammunition Effect on Correlat | 19 | 244 | 141 | 119 | 517 | 13 |
| E114 | 530 | Cartridge | RemingtonPeters | Ammunition Effect on Correlat | 28 | 514 | Not in List | 107 | 72 | Not in List |
| E115 | 524 | Cartridge | Eldorado | Ammunition Effect on Correlat | 31 | 203 | Not in List | 96 | 380 | Not in List |
| E116 | 511 | Cartridge | Winchester | Ammunition Effect on Correlat | 23 | 321 | 135 | 84 | 511 | 1 |
| E117 | 512 | Cartridge | Winchester | Ammunition Effect on Correlat | 36 | 512 | 1 | 100 | 393 | 34 |
| E118 | 499 | Cartridge | Corbon | Ammunition Effect on Correlat | 29 | 514 | Not in List | 86 | 655 | Not in List |
| E119 | 475 | Cartridge | Corbon | Ammunition Effect on Correlat | 34 | 549 | Not in List | 55 | 631 | Not in List |

## Ammunition Effect on Correlation - Test 3

| Evidence Number | CA Number | Item Descrip. | Cartridge Manufacture | Test 3 Test Type | Score in 40 S&W DB | Match To | Act. Rank in 40 S&W DB | Score in 40 S&W DB | Match To | Act. Rank in 40 S&W DB |
|---|---|---|---|---|---|---|---|---|---|---|
| E120 | 439 | Cartridge | Corbon | Ammunition Effect on Correlat | 27 | 74 | Not in List | 60 | 656 | Not in List |
| E121 | 435 | Cartridge | Corbon | Ammunition Effect on Correlat | 54 | 266 | 111 | 84 | 452 | 75 |
| E122 | 412 | Cartridge | Corbon | Ammunition Effect on Correlat | 33 | 351 | Not in List | 95 | 433 | Not in List |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| ore as  63, 55.  This has not yet been resolved on the actual data sheets | | | | | | | | | | |

## TEST 4 - BREECH FACE CHANGE

| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 4 Test Type | BREECH Score in 40 S&W DB | BREECH Match To | BREECH Rank in 40 S&W DB | |
|---|---|---|---|---|---|---|---|---|
| | | | | DATABASE SIZE E1-E792 | | | | |
| E123 | CA752 | Cartridge | Federal | Breech Face Before Filing | 41 | 752 | 1 | |
| E124 | CA753 | Cartridge | Federal | Breech Face After Filing | 22 | 597 | 35 | |
| | | | | | | | | |
| | | | | | | | | |
| | | NEXT SCORE E123 TO CA 753 AND SCORE E124 RELATIVE TO CA752 | | | | | | |
| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 4 Test Type | Breech Score to its Twin | Breech Rank in 40 S&W DB | | |
| E123 | CA752 | Cartridge | Federal | Breech Face Before Filing | Not in Selection List | | | |
| E124 | CA753 | Cartridge | Federal | Breech Face After Filing | Not in Selection List | | | |
| | | | | | | | | |
| | | | FIRING PIN DATA | | | | | |
| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 4 Test Type | Firing Pin Score in 40 S&W DB | Firing Pin Match To | Firing Pin Rank in 40 S&W DB | |
| E123 | CA752 | Cartridge | Federal | Breech Face Before Filing | 82 | 752 | 1 | |
| E124 | CA753 | Cartridge | Federal | Breech Face After Filing | 115 | 753 | 1 | |
| | | | | | | | | |
| | | NEXT SCORE E123 TO CA 753 AND SCORE E124 RELATIVE TO CA752 | | | | | | |
| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 4 Test Type | Firing Pin Score to its Twin | Firing Pin Rank in 40 S&W DB | | |
| E123 | CA752 | Cartridge | Federal | Breech Face Before Filing | Not in Selection List | | | |
| E124 | CA753 | Cartridge | Federal | Breech Face After Filing | Not in Selection List | | | |
| | | | | | | | | |
| | | Note: Not in Selection List means it was not in the top 160 of this database | | | | | | |
| | | Note: Criminalist Leslie Poole Enterd E123-E124 | | | | | | |

# Longevity Study (7)

| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 7 Test Type | Breech Score in 40 S&W DB | Breech Match To | Breech Rank in 40 S&W DB | Breech Position relative to CA XX | DB Size | |
|---|---|---|---|---|---|---|---|---|---|---|
| E125 | 793 | CCI 1-6 | CCI -Glock Type | 600 round test | 127 | CA794 | 1 | CA793= | 7 | E1254-131 EXCLUDED |
| E126 | 794 | CCI 101-106 | CCI -Glock Type | 600 round test | 111 | CA794 | 1 | CA793=4 | 7 | |
| E127 | 795 | CCI 201-206 | CCI -Glock Type | 600 round test | 108 | CA799 | 2 | CA793= | 7 | |
| E128 | 796 | CCI 301-306 | CCI -Glock Type | 600 round test | 123 | CA795 | 1 | CA793= | 7 | |
| E129 | 797 | CCI 401-406 | CCI -Glock Type | 600 round test | 113 | CA794 | 2 | CA793=3 | 7 | |
| E130 | 798 | CCI 501-506 | CCI -Glock Type | 600 round test | 168 | CA797 | | CA793=3 | 7 | |
| E131 | 799 | CCI 595-600 | CCI -Glock Type | 600 round test | 135 | CA794 | | CA793=4 | 7 | |
| E132 | 800 | IMI 0-5 | IMI - FP Drag | 600 round test | 60 | CA800 | 1 | CA800=na | 806 | |
| E133 | 801 | IMI 100-105 | IMI - FP Drag | 600 round test | 23 | CA82 | 42 | CA800=Not in List | 806 | |
| E134 | 802 | IMI 200-205 | IMI - FP Drag | 600 round test | 48 | CA135 | 5 | CA800=2 | 806 | |
| E135 | 803 | IMI 300-305 | IMI - FP Drag | 600 round test | 61 | CA804 | 10 | CA800=8 | 806 | |
| E136 | 804 | IMI 400-405 | IMI - FP Drag | 600 round test | 45 | CA805 | 2 | CA800=3 | 806 | |
| E137 | 805 | IMI 500-505 | IMI - FP Drag | 600 round test | 37 | CA801 | 10 | CA800=33 | 806 | |
| E138 | 806 | IMI 595-600 | IMI - FP Drag | 600 round test | 43 | CA801 | 11 | CA800=27 | 806 | |

**Test Note: Two from each set, one will be a "CA" number the other a "E" number**

| Evidence Number | CA Number | Item Description | Cartridge Manufacture | Test 7 Test Type | Firing Pin Score in 40 S&W DB | Firing Pin Match To | Firing Pin Rank in 40 S&W DB | Firing Pin Position relative to CA XX | DB Size | |
|---|---|---|---|---|---|---|---|---|---|---|
| E125 | 793 | CCI 1-6 | CCI -Glock Type | 600 round test | 137 | CA797 | 3 | CA793= | 13 | |
| E126 | 794 | CCI 101-106 | CCI -Glock Type | 600 round test | 104 | CA797 | 3 | CA793=9 | 13 | |
| E127 | 795 | CCI 201-206 | CCI -Glock Type | 600 round test | 108 | CA799 | 2 | CA793= | 13 | |
| E128 | 796 | CCI 301-306 | CCI -Glock Type | 600 round test | 111 | CA799 | 2 | CA793= | 13 | |
| E129 | 797 | CCI 401-406 | CCI -Glock Type | 600 round test | 127 | CA794 | 2 | CA793=3 | 13 | |
| E130 | 798 | CCI 501-506 | CCI -Glock Type | 600 round test | 168 | CA797 | | CA793=4 | 13 | |
| E131 | 799 | CCI 595-600 | CCI -Glock Type | 600 round test | 96 | CA795 | 3 | CA793= | 13 | |
| E132 | 800 | IMI 0-5 | IMI - FP Drag | 600 round test | 65 | CA800 | 1 | CA800= | 806 | |
| E133 | 801 | IMI 100-105 | IMI - FP Drag | 600 round test | 57 | CA802 | 15 | CA800=Not in List | 806 | |
| E134 | 802 | IMI 200-205 | IMI - FP Drag | 600 round test | 141 | CA805 | 3 | CA800=83 | 806 | |
| E135 | 803 | IMI 300-305 | IMI - FP Drag | 600 round test | 130 | CA802 | 2 | CA800=22 | 806 | |
| E136 | 804 | IMI 400-405 | IMI - FP Drag | 600 round test | 151 | CA804 | 1 | CA800=76 | 806 | |
| E137 | 805 | IMI 500-505 | IMI - FP Drag | 600 round test | 126 | CA805 | 1 | CA800=97 | 806 | |
| E138 | 806 | IMI 595-600 | IMI - FP Drag | 600 round test | 121 | CA805 | 11 | CA800=68 | 806 | |

# Longevity Study (7)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Note : The E series were correlated to both CA series and the E-125-E138 series.  For the pupose of this test, the | | | | | | | | | |
| correlation to another E series was not used, only the correlation to the CA series. | | | | | | | | | |

50 Random Cartridge Cases

| | 50 Random Cartridge Cases - Same Ammunition - Performance Test 1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Highest Rank FP or Breech Face** | | | | **Breech Face** | | | **Firing Pin** | | |
| E1 | 1 | | | 4 | | | 1 | | |
| E2 | 36 | | | 36 | | | 105 | | |
| E3 | 2 | | | 2 | | | 83 | | |
| E4 | 7 | Combined | | 129 | Breech Face | | 7 | Firing Pin | |
| E5 | 77 | **Rank** | **Number** | 113 | **Rank** | **Number** | 77 | **Rank** | **Number** |
| E6 | 47 | 1 | 24 | 62 | 1 | 13 | 47 | 1 | 13 |
| E7 | 1 | 2 | 3 | 78 | 2 | 3 | 1 | 2 | 1 |
| E8 | 30 | 3 | 1 | 30 | 3 | 1 | 140 | 3 | 1 |
| E9 | 88 | 4 | 0 | 116 | 4 | 1 | 88 | 4 | 1 |
| E10 | ns | 5 | 0 | ns | 5 | 0 | ns | 5 | 0 |
| E11 | 1 | 6 | 1 | 122 | 6 | 1 | 1 | 6 | 0 |
| E12 | 6 | 7 | 1 | 6 | 7 | 0 | 10 | 7 | 3 |
| E13 | 1 | 8 | 0 | 1 | 8 | 0 | 7 | 8 | 0 |
| E14 | 1 | 9 | 1 | 90 | 9 | 0 | 1 | 9 | 2 |
| E15 | 9 | 10 | 0 | 58 | 10 | 0 | 9 | 10 | 0 |
| E16 | 1 | 11 | 0 | 1 | 11 | 0 | 49 | 11 | 0 |
| E17 | 1 | 12 | 0 | 1 | 12 | 0 | 9 | 12 | 0 |
| E18 | 1 | 13 | 0 | 1 | 13 | 1 | 68 | 13 | 0 |
| E19 | 40 | 14 | 0 | 138 | 14 | 0 | 40 | 14 | 0 |
| E20 | 1 | 15 | 0 | 1 | 15 | 0 | 4 | 15 | 0 |
| E21 | 1 | **Higher/Miss** | 19 | 13 | **Higher/Miss** | 28 | 1 | **Higher/Miss** | 29 |
| E22 | ns | | | ns | | | ns | | |
| E23 | 3 | | | 3 | | | 3 | | |
| E24 | 1 | | | 80 | | | 1 | | |
| E25 | 1 | | | 118 | | | 1 | | |
| E26 | 1 | | | 1 | | | 7 | | |
| E27 | ns | | | ns | | | ns | | |
| E28 | 1 | | | 1 | | | 63 | | |
| E29 | 1 | | | 1 | | | 131 | | |
| E30 | 45 | | | 45 | | | 111 | | |
| E31 | 90 | | | 90 | | | 131 | | |
| E32 | 1 | | | 109 | | | 1 | | |
| E33 | 73 | | | 73 | | | 122 | | |
| E34 | ns | | | ns | | | ns | | |
| E35 | ns | | | ns | | | ns | | |
| E36 | 1 | | | 1 | | | 115 | | |
| E37 | 2 | | | 2 | | | 23 | | |
| E38 | 1 | | | 1 | | | 1 | | |
| E39 | ns | | | ns | | | ns | | |
| E40 | 1 | | | 131 | | | 1 | | |
| E41 | 27 | | | 80 | | | 27 | | |
| E42 | 1 | | | 1 | | | 2 | | |
| E43 | ns | | | ns | | | ns | | |
| E44 | 1 | | | 45 | | | 1 | | |
| E45 | 1 | | | 145 | | | 1 | | |
| E46 | ns | | | ns | | | ns | | |
| E47 | 2 | | | 2 | | | 45 | | |
| E48 | 1 | | | 1 | | | 45 | | |
| E49 | ns | | | ns | | | ns | | |
| E50 | 1 | | | 1 | | | 1 | | |

| | 50 Random Cartridge Cases - Same Ammunition - Performance Test 1 | | | | | | |
|---|---|---|---|---|---|---|---|
| Highest Rank FP or Breech Face | | Breech Face | | | Firing Pin | | |
| | Number with both in top 15 = | | | 11 | | | |
| | Percent | | | | 22% | | |
| | | | | | | | |
| | Number with both in the first rank = | | | 2 | | | |
| | Percent | | | | 4% | | |

| | Ammunition Effect on Correlation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Performance Test #3 Summary Data | | | n=72 | | | | | |
| Highest Rank FP or Breech Face (note1) | | | Breech Face | | | Firing Pin | | | |
| E51 | 1 | | | 1 | | | 1 | | |
| E52 | 1 | | | 1 | | | 3 | | |
| E53 | nl | | | nl | | | nl | | |
| E54 | 1 | Rank | Number | 1 | Rank | Number | 3 | Rank | Number |
| E55 | nl | 1 | 16 | nl | 1 | 11 | nl | 1 | 6 |
| E56 | nl | 2 | 2 | nl | 2 | 0 | nl | 2 | 2 |
| E57 | 49 | 3 | 1 | 49 | 3 | 0 | 79 | 3 | 3 |
| E58 | nl | 4 | 1 | nl | 4 | 0 | nl | 4 | 1 |
| E59 | 1 | 5 | 1 | 1 | 5 | 1 | 50 | 5 | 0 |
| E60 | 24 | 6 | 0 | 123 | 6 | 0 | 24 | 6 | 0 |
| E61 | nl | 7 | 0 | nl | 7 | 0 | nl | 7 | 1 |
| E62 | nl | 8 | 0 | nl | 8 | 0 | nl | 8 | 0 |
| E63 | 56 | 9 | 0 | 56 | 9 | 1 | 92 | 9 | 0 |
| E64 | nl | 10 | 0 | nl | 10 | 0 | nl | 10 | 0 |
| E65 | 52 | 11 | 0 | 73 | 11 | 0 | 52 | 11 | 0 |
| E66 | nl | 12 | 0 | nl | 12 | 0 | nl | 12 | 1 |
| E67 | 1 | 13 | 3 | 1 | 13 | 2 | 13 | 13 | 2 |
| E68 | 56 | 14 | 3 | 56 | 14 | 1 | 134 | 14 | 2 |
| E69 | 27 | Higher/Miss | 45 | 51 | Higher/Miss | 56 | 27 | Higher/Miss | 53 |
| E70 | 72 | | | 135 | | | 72 | | |
| E71 | 62 | | | 119 | | | 62 | | |
| E72 | nl | | | nl | | | nl | | |
| E73 | nl | Rank | % | nl | Rank | % | nl | Rank | % |
| E74 | nl | 1 | 22.2% | nl | 1 | 15.3% | nl | 1 | 8.3% |
| E75 | 1 | 2 | 2.7% | 139 | 2 | 0.0% | 1 | 2 | 2.8% |
| E76 | 86 | 3 | 1.4% | 103 | 3 | 0.0% | 86 | 3 | 4.1% |
| E77 | 3 | 4 | 1.4% | 49 | 4 | 0.0% | 3 | 4 | 1.4% |
| E78 | 49 | 5 | 1.4% | 101 | 5 | 1.4% | 49 | 5 | 0.0% |
| E79 | 27 | 6 | 0.0% | 27 | 6 | 0.0% | 81 | 6 | 0.0% |
| E80 | nl | 7 | 0.0% | nl | 7 | 0.0% | nl | 7 | 1.4% |
| E81 | 14 | 8 | 0.0% | 125 | 8 | 0.0% | 14 | 8 | 0.0% |
| E82 | nl | 9 | 0.0% | nl | 9 | 1.4% | nl | 9 | 0.0% |
| E83 | nl | 10 | 0.0% | nl | 10 | 0.0% | nl | 10 | 0.0% |
| E84 | 20 | 11 | 0.0% | 146 | 11 | 0.0% | 20 | 11 | 0.0% |
| E85 | 13 | 12 | 0.0% | 13 | 12 | 0.0% | 28 | 12 | 1.4% |
| E86 | 1 | 13 | 4.2% | 1 | 13 | 2.8% | 61 | 13 | 2.8% |
| E87 | 56 | 14 | 4.2% | 108 | 14 | 1.4% | 56 | 14 | 2.8% |
| E88 | 2 | Higher/Miss | 62.5% | 69 | Higher/ Miss | 77.7% | 2 | Higher/ Miss | 73.6% |
| E89 | 14 | | | 14 | | | 17 | | |
| E90 | 1 | | | 1 | | | 133 | | |
| E91 | 1 | | | 1 | | | 12 | | |
| E92 | nl | | | nl | | | nl | | |
| E93 | 1 | | | 1 | | | 35 | | |
| E94 | 1 | | | 1 | | | 8 | | |
| E95 | nl | | | nl | | | nl | | |
| E96 | 1 | | | 86 | | | 1 | | |
| E97 | 2 | | | 132 | | | 2 | | |
| E98 | nl | | | nl | | | nl | | |
| E99 | 1 | | | 9 | | | 1 | | |
| E100 | 88 | | | 88 | | | 105 | | |
| E101 | 13 | | | 13 | | | 38 | | |
| E102 | 5 | | | 5 | | | 7 | | |
| E103 | 45 | | | 45 | | | 70 | | |
| E104 | 30 | | | 30 | | | 49 | | |
| E105 | 80 | | | 149 | | | 80 | | |

| Ammunition Effect on Correlation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Test #3 Summary Data | | | Breech Face | n=72 | | Firing Pin | |
| **Highest Rank FP or Breech Face (note1)** | | | **Breech Face** | | | **Firing Pin** | |
| **E106** | nl | | nl | | | nl | |
| **E107** | nl | | nl | | | nl | |
| **E108** | 1 | | 163 | | | 1 | |
| **E109** | 4 | | 119 | | | 4 | |
| **E110** | 18 | | 44 | | | 18 | |
| **E111** | 14 | | 113 | | | 14 | |
| **E112** | 29 | | 64 | | | 29 | |
| **E113** | 13 | | 141 | | | 13 | |
| **E114** | nl | | nl | | | nl | |
| **E115** | nl | | nl | | | nl | |
| **E116** | 1 | | 135 | | | 1 | |
| **E117** | 1 | | 1 | | | 34 | |
| **E118** | nl | | nl | | | nl | |
| **E119** | nl | | nl | | | nl | |
| **E120** | nl | | nl | | | nl | |
| **E121** | 75 | | 111 | | | 75 | |
| **E122** | nl | | nl | | | nl | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | Number with both breech face and firing pin impression in Top 15 = | | | | | **8** | |
| | | | | Percent | | **11%** | |
| | Number with both breech face and firing pin impression in top position | | | | | **1** | |
| | | | | Percent | | **1.4%** | |
| Note1:  After a cartridge case was selected, it is removed from the pool to avoid false high results- breech face 1st | | | | | | | |

**APPENDIX D**

**SURVEY REPORTS BY TECHNICAL COMMITTEE MEMBERS**

The members of the technical committee were asked to answer the questions posed by the following questionnaire.  Their responses are attached;

The following request was send to each of the technical committee members participating in this study.

<u>Technical Survey</u>
These are the suggested topics each examiner should cover in the report of their database. This format will be placed in a more uniform and logical format once corrections are made.  **<u>Please look this over carefully and see if it answers all the possible issues.</u>**

- How long have you had and what type is your Ballistics Imaging system?
- How many breach face images?
- How many of these are **<u>evidence</u>** and how many are **<u>tests?</u>**
- Breakdown of evidence cartridge cases by chamber?
- Breakdown of test cartridge cases by chamber?
- Breakdown of test cartridge cases by firearm manufacturer?
- How many cold hits per year?
- What provides the most hits? (Type of firearm seizure)
- Caliber?
- Manufacturer?
- Firearms excluded from the database?
- Case illustrations relevant to the value of a database positive or negative.
- Hit rate labor effort
- How many candidate screen hits were correlated as candidates and looked at by optical comparison and found not to match?
- What is the approximate rate of optical comparison of candidates that are hits and those that are not?
- How long does the average optical comparison take?
- What is the total labor time to retrieve and compare a candidate cartridge case using the optical comparison microscope?
- Statement based on your expertise as to the value of using the first set bullets, from new handguns, for test firing or the stability of bullets.  Cite articles?
- What is your Bullet hit rate versus cartridge case-hit rate?
- What is the size of you bullet database?
- How many evidence cartridge cases would you submit each year to DOJ for resolution if they had a statewide database of all new handgun sales?
- Geographic areas of hits - Where do you find most of your hits? Percentage if possible?
- Local

- Adjacent cities or counties?
- Broad regional, i.e. Southern California, Central California, Northern California?

  - Time to validate a typical cold hit?
  - IBIS time
  - Comparison Microscope Times
  - Clerical time
  - Evidence chain time
  - Supervisor review time
  - Report preparation time
  - Number of cold hits by your agency that have led to a prosecution?
  - Number of cold hits that had a handgun with serial numbers removed?
  - Which violation provides the best change of a cold hit for cartridge case data? (i.e. carrying concealed weapon, Family disturbance, drug trade etc.)

# DATABASE PROFILES

The Southern California Database has the data on a server that is maintained by the Orange County Sheriff's Department.  Their statistics are probably the most accurate and reflects the results from all the Southern California Agencies using the DRUGFIRE system.  This includes the Los Angeles Police Department

## 1. SOUTHERN CALIFORNIA DATABASE
**Date:**  April 12, 2001
**From:** Tom Matsurdaira, Orange County S.O.
**To:**     Fred Tulleners

The attached is the file of the Southern Cal DRUGFIRE data, broken down by caliber.  I went through the individual listing of hits and weeded out duplicates, warm hits, etc. I think 433 cold hits are pretty close to the actual number, though what some are calling cold vs warm may be questioned. Since some of the firearms responsible for cold hits have more than one association (i.e. serial weapons), I've also broken it down into how many firearms are actually responsible for the 433 cold hits is 338.

### SOUTHERN CALIFORNIA DRUGFIRE STATISTICS

| Caliber | Evidence Cartridges | | Test Fired Cartridges | | | | Cold Hit | Evidence |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Cases | Items | Cases | Items | | Cold Hits | Firearms | % Hit Rate |
| 25 Auto | 668 | 695 | 5075 | 5167 | | 21 | 20 | 3.1% |
| 32 Auto | 191 | 196 | 1112 | 1131 | | 9 | 8 | 4.7% |
| 380 Auto | 1137 | 1421 | 6138 | 6290 | | 57 | 47 | 5.0% |
| 9mm Luger | 3422 | 3875 | 10532 | 11200 | | 231 | 185 | 6.8% |
| 38 Auto/Super | 117 | 127 | 471 | 483 | | 6 | 6 | 5.1% |
| 40 S&W | 388 | 406 | 1064 | 1086 | | 38 | 21 | 9.8% |
| 10mm Auto | 65 | 66 | 131 | 135 | | 6 | 3 | 9.2% |
| 45 Auto | 976 | 1022 | 2910 | 3028 | | 58 | 42 | 5.9% |
| 30 Carbine | 58 | 59 | 65 | 68 | | | | 0.0% |
| 9mm Makarov | 40 | 40 | 192 | 193 | | | | 0.0% |
| 223 Remington | 79 | 85 | 96 | 108 | | 3 | 2 | 3.8% |
| 7.62x39mm | 224 | 252 | 224 | 257 | | | | 0.0% |
| 7.62x25mm | 15 | 15 | 69 | 70 | | 1 | 1 | 6.7% |
| 30-'06 Sprg | 4 | 4 | 15 | 15 | | 1 | 1 | 25.0% |
| Total Centerfire | | 8263 | | 29231 | | 431 | | |
| | | | | | | | | |
| Shotshells | 74 | 80 | 204 | 241 | | | | |
| 22 LR | 303 | 329 | 1467 | 1583 | | 2 | 2 | 0.7% |
| 22 Short | 8 | 8 | 70 | 70 | | | | |
| 22 Win Mag | 3 | 3 | 21 | 23 | | | | |
| | | | | | | | 338 | |
| **Total in Database** | 7153 | 8671 | 26413 | 28814 | **Total Hits** | 433 | | 6.1% |

# Firearms in the Southern California Database

| Company | Model | Chamber | No. | Company | Model | Chamber | No. |
|---|---|---|---|---|---|---|---|
| AA Arms | AP9 | 9mm Luger | 6 | Kirikkale | | 380 Auto | 1 |
| AMT | Back Up | 380 Auto | 2 | Llama | 1911A1 | 45 Auto | 1 |
| | Back Up | 38 Super Auto | 1 | | 3A/Especial | 380 Auto | 3 |
| | Back Up | 45 Auto | 1 | | Max 1 CF | 9mm Luger | 2 |
| | On Duty | 9mm Luger | 1 | | Unknown | 9mm Luger | 1 |
| Astra | A70 | 9mm Luger | 1 | | Unknown | 45 Auto | 1 |
| | A75 | 45 Auto | 1 | Lorcin | L25 | 25 Auto | 1 |
| | 1921 | 9mm Luger | 1 | | L380 | 380 Auto | 1 |
| Auto Ordnance | | 38 Auto | 1 | | L9MM | 9mm Luger | 11 |
| Baikal | 1570-17A | 380 Auto | 1 | Marlin Firearms | 9 | 9mm Luger | 1 |
| | IJ70-17A | 380 Auto | 1 | Mauser | 1934 | 32 Auto | 1 |
| Beretta | 70S | 380 Auto | 2 | | HSc | 32 Auto | 1 |
| | 84 Series | 380 Auto | 5 | Michigan Armament | Custom Combat | 45 Auto | 1 |
| | 85F | 380 Auto | 1 | Norinco | 213 | 9mm Luger | 3 |
| | 92 Series | 9mm Luger | 16 | | 1911A1 | 45 Auto | 1 |
| | 950BS | 25 Auto | 6 | Phoenix Arms | Raven | 25 Auto | 1 |
| Bersa | | 380 Auto | 5 | Quality Firearms | LA380 | 380 Auto | 2 |
| Browning | BDA380 | 380 Auto | 2 | Raven | MP25 | 25 Auto | 5 |
| | Hi Power | 9mm Luger | 7 | Remington | Gamemaster 760 | 30-'06 Sprg. | 1 |
| | SIG Sauer System | 38 Auto | 1 | Rigarmi/Galesi | 9 | 25 Auto | 1 |
| Ceska Zbrojovka | CZ 52 | 7.62x25mm | 1 | Rocky Moun-tain Arms | | 223 Rem | 1 |
| Chinese | TU90 | 9mm Luger | 1 | Ruger | Mini 14 | 223 Rem | 1 |
| Cobray | M11 | 9mm Luger | 4 | | P85 | 9mm Luger | 4 |
| | M12 | 380 Auto | 1 | | P89/P89DC | 9mm Luger | 14 |
| Colt | Combat Commander | 38 Auto | 1 | | P90/P90DC | 45 Auto | 4 |
| | Delta Elite | 10mm Auto | 1 | | P94 | 40 S&W | 1 |
| | Double Eagle | 45 Auto | 1 | | P95DC | 9mm Luger | 1 |
| | Gold Cup | 45 Auto | 3 | SIG Sauer | P226 | 9mm Luger | 3 |
| | Government/1911 | 45 Auto | 5 | | P228 | 9mm Luger | 1 |
| | M1991A1 | 45 Auto | 1 | | P220 | 45 Auto | 2 |
| | Pocket | 32 Auto | 1 | | P230 | 380 Auto | 2 |

| Company | Model | Chamber | No. | Company | Model | Chamber | No. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | Pocketlite | 380 Auto | 1 | Sites | Spectre HC Pistol | 9mm Luger | 1 |
| | Super 38 | 38 Auto | 1 | Smith & Wesson | 59/539/5904 | 9mm Luger | 4 |
| Daewoo | DP51 | 9mm Luger | 1 | | 439/459/469 | 9mm Luger | 3 |
| Davis Industries | P32 | 32 Auto | 2 | | 645 | 45 Auto | 1 |
| | P380 | 380 Auto | 7 | | 659/669/6906 | 9mm Luger | 3 |
| Excam | GT27 | 25 Auto | 1 | | 915 | 9mm Luger | 3 |
| Feather Industries | Mini AT | 22 LR | 1 | | 3915 | 9mm Luger | 1 |
| FEG | P9R/P9RK | 9mm Luger | 2 | | 4506 | 45 Auto | 2 |
| | PMK380 | 380 Auto | 1 | | Sigma | 9mm Luger | 2 |
| FIE | E28 | 25 Auto | 1 | | Sigma | 40 S&W | 1 |
| | SPP | 380 Auto | 1 | Springfield | 1911A1 | 45 Auto | 2 |
| FMAP | Army Model | 45 Auto | 1 | Stallard | JS9MM | 9mm Luger | 2 |
| Glock | 17 | 9mm Luger | 21 | Star | 30PK | 9mm Luger | 1 |
| | 19 | 9mm Luger | 14 | | BKM | 9mm Luger | 1 |
| | 20 | 10mm Auto | 2 | | FireStar | 9mm Luger | 3 |
| | 21 | 45 Auto | 8 | | FireStar | 40 S&W | 1 |
| | 22 | 40 S&W | 5 | | FireStar M45 | 45 Auto | 1 |
| | 23 | 40 S&W | 9 | | MegaStar 45 | 45 Auto | 1 |
| | 26 | 9mm Luger | 1 | | NA | 45 Auto | 1 |
| | 27 | 40 S&W | 1 | | PD | 45 Auto | 1 |
| Haskell | JS | 45 Auto | 4 | | Unknown | 9mm Luger | 1 |
| Heckler & Koch | P9S | 9mm Luger | 1 | Sterling Arms | | 25 Auto | 1 |
| | USP/USP Compact | 40 S&W | 2 | Sundance Ind. | Laser 25 | 25 Auto | 1 |
| Helwan | | 9mm Luger | 1 | Tanfoglio | Compact | 9mm Luger | 1 |
| Hi Point | C | 9mm Luger | 5 | | GT380 | 380 Auto | 3 |
| | CF | 380 Auto | 1 | | Titan | 25 Auto | 2 |
| Hungarian | FP9 | 9mm Luger | 1 | | TZ75 | 9mm Luger | 1 |
| IMI | Desert Eagle | 9mm Luger | 1 | Taurus | PT92AF | 9mm Luger | 5 |
| | UZI 45SA | 45 Auto | 1 | | PT99AF | 9mm Luger | 4 |
| Industria Argentina | Hi Power | 9mm Luger | 1 | | PT100AF | 40 S&W | 1 |
| Intratec | Cat. 9 | 9mm Luger | 3 | | PT111 | 9mm Luger | 1 |
| | TEC-9 | 9mm Luger | 2 | Unknown | SW3980 | 32 Auto | 1 |
| Jennings | Bryco 59 | 9mm Luger | 12 | Walther | PP | 380 Auto | 1 |
| | Bryco 58 | 380 Auto | 3 | | PPK | 32 Auto | 1 |
| | J22LR | 22 LR | 1 | | PPK/S | 380 Auto | 1 |
| Keltec | P11 | 9mm Luger | 1 | Wautauga | | 32 Auto | 1 |
| | | | | Wautauga | | 32 Auto | 1 |

**Total Firearms = 338**

**Agency Questionnaire**

Agency:      **Oakland Police Department**
Submitter:   **Criminalist Lansing Lee**
Date:        **February 2001**
System:      **IBIS DAS/R**

1. How long have you had and what type is your Ballistics Imaging system?

   Oakland P.D. has an IBIS DAS/R since December 1995

2. How many Breech face images?

   2154 as of 26 Feb 2001

3. How many of these are evidence and how many are tests?

   1775 Test Fires and 379 Evidence

4. Breakdown of evidence cartridge cases by chamber?

| Caliber | Number of Evidence Casings |
|---|---|
| .380 AUTO | 80 |
| 9mm luger | 211 |
| .40 S&W | 24 |
| .45 AUTO | 43 |
| 10mm AUTO | 1 |
| 9mm MAK | 2 |
| 7.62x39mm | 7 |
| Other | 11 |

5. Breakdown of test cartridge cases by chamber?

| Caliber | Number of Test Casings |
|---|---|
| .380 AUTO | 601 |
| 9mm luger | 870 |
| .40 S&W | 88 |
| .45 AUTO | 190 |
| 10mm AUTO | 2 |
| 9mm MAK | 6 |
| 7.62X39mm | 7 |
| Other | 11 |

Breakdown of test cartridge cases by firearm manufacturer?

>REMARK:  breakdown by firearm manufacturer statistics are not retrievable with current software from FTI.

6.  How many cold hits per year?

>Approximately 5 cold hits per year.  37 cold hits to date.

7.  What provides the most hits by?  Brasscatcher over Bulletproof
Caliber?  no data
Manufacturer?  no data

8.  Firearms excluded from the database?

>Only high usage firearms are included in our database with some exception.  This was a decision based on available manpower.
>Calibers included:    .380 AUTO
>    .38 SPL
>    .357 magnum
>    9mm luger
>    .40 S&W
>    10mm AUTO
>    .45 AUTO

9.  Case illustrations relevant to the value of a database positive or negative.

   a.  The 37 hits to date would not have been possible without IBIS.
   b.  One of 37 hits has led to a conviction without any other information available to investigators prior to IBIS hit.
   c.  Manpower necessary for use of IBIS was anticipated.  However, the level of manpower was not provided/available, so IBIS program to date has been taken out of existing sources.

10. Hit rate labor efforts

   a.  For Brasscatcher, hits are usually fairly obvious and tend to "jump out" at you when viewed on screen.  Optical confirmation required with very few negatives.  (less than 5%???)
   b.  For Bulletproof, hits are more circumspect and require more frequent optical viewing with a significant percentage ending up negative (50-75%???)
   c.  Optical comparison takes time similar to any comparison.  Approx 30 minutes including note taking and photo documentation.
   d.  Total labor time for optical comparison including retrieval to return maybe one or two days depending on number of exhibits.

11. Statement based on your expertise as to the value of using the first set bullets, from new handguns, for test firing or the stability of bullets. Cite articles?

    1. There would be some value in that there are several articles published relating to the persistence of identifiable striations on first through many thousands of test fires.
    2. Crooks are not very smart, although some subset of crooks would be smart enough to alter firearms to lessen there hit potential. i.e. Although any fool knows that latent prints identify crooks, not all crooks wear gloves. Although, any fool knows DNA is found in semen, not all rapists use condoms, etc.
    3. The question is what is the cost versus benefit and what is the public willing to pay.

12. What is your Bullet hit rate versus cartridge hit rate?

    Of 37 hits, 8 used Bulletproof and 29 used Brasscatcher.
    Overall hit rate is around 8%

13. What is the size of your bullet database?

    ATF has been putting in the majority of our test fired bullets.

14. How many evidence cartridge cases would you submit each year to DOJ for resolution if they had a statewide database of all new handgun sales?

    Unknown

15. Where do you find most of your hits?

    Virtually all hits are local. 3 of 37 hits were from Contra Costa County SO DAS/R. Remark: Alameda County agencies rely on ACSO which is fee for service and charges for exam/test firing/data entry.

16. Time to validate a typical cold hit?

    IBIS time –maybe 15 minutes
    Comparison microscope time – maybe 1-2 hours depending on number of exhibits
    Clerical time – maybe 15 minutes
    Evidence chain time – maybe 30-60 minutes
    Supervisor review time – maybe 15 – 60 minutes

17. Number of cold hits by your agency that have led to a prosecution?

    One known that led to arrest and conviction with no other investigative leads available until after IBIS hit was reported.

18. Number of cold hits that had a handgun with serial numbers removed?

    Unknown

19. Which violation provides the best chance of a cold hit for cartridge case data?

    Drug related firearm recoveries.

**Agency Questionnaire**

Agency:       **Los Angels Police Department**
Submitter:    **Criminalist Dennis Fung**
Date:         **April 20, 2001**
System:     **DRUGFIRE**

(Note:  The data in this survey reflects the same that was submitted for the Southern California Database.  The actual data from the database server of the Southern California group may be more accurate.  This survey also lists the number of images. Keep in mind that one cartridge case may have several images that are correlated when one uses the DRUGFIRE system)

1.  How long have you had and what type is your Ballistics Imaging system?
    **LAPD has had the DRUGFIRE system for seven and one half years**.

2.  How many Breach face images?
    **Over 41, 000**

3.  How many of these are **evidence** and how many are **tests?**
    **There are over 7,900 evidence images and over 33,000 test fires**

4.  Breakdown of evidence cartridge cases by chamber?

| Cartridge | Number |
|---|---|
| 22 Long Rifle | 329 |
| 25 Auto | 629 |
| 30 Carbine | 59 |
| 32 Auto | 197 |
| .357 Magnum | 13 |
| 380 Auto | 1410 |
| 9mm Makarov | 40 |
| 9mm Luger | 3,818 |
| 38 Auto | 127 |
| 40 S&W | 404 |
| 10mm Auto | 66 |
| 44 Remington Magnum | 3 |
| 45 Auto | 1015 |
| 45 Winchester Magnum | 2 |
| 7.62 X 39 Rifle | 250 |
| 223 Remington | 85 |
| 308 Winchester | 3 |

5. Breakdown of test cartridge cases by chamber?

| Cartridge | Number |
|---|---|
| 22 Long Rifle | 1,583 |
| 25 Auto | 5,158 |
| 30 Carbine | 66 |
| 32 Auto | 1,130 |
| .357 Magnum | 114 |
| 380 Auto | 6,278 |
| 9mm Makarov | 193 |
| 9mm Luger | 11,143 |
| 38 Auto | 457 |
| 40 S&W | 1,075 |
| 10 mm Auto | 135 |
| 44 Remington Magnum | 64 |
| 45 Auto | 3,006 |
| 45 Winchester Magnum | 11 |
| 7.62 X 39 | 254 |
| 223 Remington | 108 |
| 308 Winchester | 22 |

6. Breakdown of test cartridge cases by firearm manufacturer?
   **LAPD has taken in a vast array of different firearms by hundreds of different manufactures. However, provided are some of the quantities for the most frequent brands**

| Manufacturer | Number |
|---|---|
| Beretta | 2,864 |
| Browning | 737 |
| Colt | 2,285 |
| Davis | 1,643 |
| Glock | 1,840 |
| Intratec | 492 |
| Jennings | 1,708 |
| Lorcin | 2,096 |
| Norinco | 556 |
| Phoenix | 611 |
| Raven | 1,484 |
| Sig Sauer and Sons | 625 |
| Star | 825 |
| Sturm Ruger | 1,690 |
| Taurus | 667 |
| Walther | 521 |

7. How many cold hits per year?
   **Average: 87 after system and DRUGFIRE operations were fully functional**

8. What provides the most hits by?
   **Caliber: 9 Luger, Manufacturer: Glock**

9. Firearms excluded from the database**?**
   **Revolvers, Derringers**

10. Case illustrations relevant to the value of a database positive or negative.
    **Clarify?**

11. Hit rate labor effort
    - How many candidate screen hits were correlated as candidates and looked at by optical comparison and found not to match? **46 out of 700 positives** (Actual cold hit rate is the same as the SOCAL database hit rate. However hits can be counted several ways and this can vary the number. SOCAL only counts a cold hit when it has been verified by optical comparison – DH telecon 5/16/01)
    - What is the approximate rate of optical comparison of candidates that are hits and those that are not? **One in fifteen DRUGFIRE initiated comparisons are found not to match.**
    - How long does the average optical comparison take? **2 hours**
    - What is the total labor time to retrieve and compare a candidate cartridge case using the optical comparison microscope? **Approximately 11 labor hours**

**12.** Statement based on your expertise as to the value of using the first set bullets, from new handguns, for test firing or the stability of bullets. Cite articles?
    **Unknown, LA Lab Experts gone at the time of the survey**

13. What is your Bullet hit rate versus cartridge-hit rate?
    **No bullet input in LA lab at time of survey**

14. What is the size of you bullet database?
    **N/A. No bullet input**

15. How many evidence cartridge cases would you submit each year to DOJ for resolution if they had a statewide database of all new handgun sales?
    **800-1000**

16. Geographic areas of hits - Where do you find most of your hits? Percentage if possible?
    - Local: **90%**
    - Adjacent cities or counties: **9%**
    - Broad regional areas: **1%**

17. Time to validate a typical cold hit?
    - DRUGFIRE Time: **30 Minutes to an hour**
    - Comparison Microscope Times: **1-2 hours**
    - Clerical time: **3 to 4 hours including examiners' reports**
    - Evidence chain time: **2 to 4 hours**
    - Supervisor review time: **1-2 hours**

18. Number of cold hits by your agency that have led to a prosecution?
    **25 cold hits have required court testimony by the examiner. The resolution and type of court is not known.** (DH telecon 5-16-01)

19. Number of cold hits that had a handgun with serial numbers removed?
    **Approximately 70**

20. Which violation provides the best change of a cold hit for cartridge case data?
    (i.e. carrying concealed weapon, Family disturbance, drug trade etc.)
    - **Carrying a concealed weapon**
    - **Ex Convict with a gun**
    - **Felony narcotics arrest**

**Agency Questionnaire**

Agency:        **Sacramento County Laboratory of Forensic Science**
Submitter:   **Criminalist Leslie Poole**
Date:          **April 2001**
System:      **IBIS DAS/R**

Sacramento County has been using the IBIS system from September 10, 1996 to the present.  The current data has a cutoff date of 4/10/01

**Total Cartridge Cases        2829**
**Evidence Cartridges          822**
**Total Bullets               1168**
**Evidence Bullets             300**
**Total Cold Hits               15 (14 cartridge cases and 1 bullet)**
**Total Prosecutions        None**

**Cartridges**
Cartridge Chamber and Caliber Designations
   Pistol Type
   • 10 Auto            12
   • 25 Auto           178
   • 32 Auto            39
   • 380 Auto          295     (CIRC=288, GLO=1, REC=4)
   • 38 SA             11
   • 40 S&W            160     (CIRC=101, GLO =50)
   • 9mm Luger         837     (CIR=635, GLO=147, REC=54
   • 9mm Mak            14
   • 45 ACP            202
   Shotgun Type
   • .410 Gauge         28
   • 20 Gauge           28
   • 16 Gauge            5
   • 12 Gauge          244
   Rifle Type
   • .223 Remington     24
   • 762 R & T          96
   • .30 Cal            23
   Miscellaneous
   • 22LO              254
   • 22LR               60
   • 22SH               15
   Revolver Type
   •  357               37
   • 38 Special        162

- 44 Rem Magnum        20

**Bullets**

By Cartridge Designations
- 22LR          9
- 7.62 R&F      35
- .223REM       3
- 3006          7
- 303-30        5
- 30 Carbine    7
- .357          60
- 38SP          247
- 32 Auto       25
- 44 RM         15
- 380 Auto      144
- 40S&W         52
- 10mm          4
- 9mm Luger     327
- 25 Auto       88
  9Mak          5

**RESPONSE BY FORENSIC TECHNOLOGY INC. TO IBIS RELATED QUESTIONS**

**Date Submitted:**     February 26, 2001
**Date Received:**      March 5, 2001
**Author:**             Rene Belanger, P.Eng. Forensic Technology Inc.
**Questions by**:       Fred Tulleners, Bureau of Forensic Services, CA. Dept. of Justice

1.  **Image Size for the breach face impression**:
    *   What is the size and format in KB of the actual image taken by the
    *   DAS microscope?
    *   How many Gray Scale Levels
    *   What is the size of the text data?
    *   Are these combined into one file or do they stay separate?

    **Answer:**
    Upon a breech face image acquisition, the size of the captured original breech face image is 230.400 KB**.**  During the acquisition, a compressed image is generated from the original image, the file size of the compressed image is approximately 22.579 KB**.**  The original Image is captured with 256 levels of gray.  The text data or demographics are insignificant in terms of memory as they take up approximately only 1 KB.  All these files are stored in separate tables within the database but at the same time associations within the database links them.

2.  **Image Size for the Firing Pin impression:**
    What is the size and format in KB of the actual image taken by the DAS microscope?
    How many Gray Scale Levels?
    What is the size of the text data?
    Are these combined into one file or do they stay separate?

    **Answer:**
    Upon a firing pin image acquisition, the size for a captured original firing pin Image is 230.400 *KB*.  During the acquisition, a compressed image is generated from the original image with a file size of approx.  20.169 KB. The original image is taken with 256 levels of gray scale.  The text data or demographics are insignificant in terms of memory as they take up approximately only 1 KB.  All these files are stored in separate tables within the database but at the same time associations within the database links them.

3.  **When the image is correlated is it correlated on the original image size or on the compressed image.**

    **Answer:**
    The image as such is not correlated. Upon completion of the acquisition process, significant information is extracted from the original image. This information is called the "signature" and corresponds to a mathematical representation of the image. The correlation algorithm is comparing those signatures using a series of mathematical computations.

4.  **When the image is sent back as the candidate image, is it compressed? What format? How much compression?**

    **Answer:**
    Any image traveling on the Local Area Network or on the Wide Area Network is compressed. These images are compressed approximately 10 times. Compression of the image is performed with a JPEG algorithm.

5.  **How long does it take to correlate an image? Using your established data bases, can you tell me the time it take to perform the following correlation for firing pin and breach face impressions for the following:**

    - Using 500 - 9 mm cartridge cases as a database, time the correlation of one particular cartridge case.
    - Using 1000 - 9 mm cartridge cases as a database, time the correlation of the same cartridge case.
    - Using 1500 - 9 mm cartridge cases as a database, time the correlation of the same cartridge case.
    - Using 2000 - 9 mm cartridge cases as a database, time the correlation of the same cartridge case.
    - Could specify the computer architecture that you are running this correlation on?

    **Answer:**
    As you probably know correlation speed is influenced by several criteria such as database size, sample size, correlation server configuration, etc. To answer your question, I will base my numbers on the largest computer we have used so far in an IBIS installation. A Silicon Graphics Origin 2400 correlation server with 16 processors, each having a clock speed of 400 Mhz was recently installed and tested by FTI. According to database sizes you have provided. Using the server specified above and considering that only breech face and firing pin images would be acquired (no ejector marks), the correlations of both the breech face and firing pin impressions would take approximately the following amount of time:

    - one cartridge case against 500 - 9 mm = 6 seconds

- one cartridge case against 1000 - 9mm = 12 seconds
- one cartridge case against 1500 - 9mm = 18 seconds
- one cartridge case against 2000 - 9mm = 24 seconds
- one cartridge case against 2500 - 9mm = 30 seconds

It is obvious that smaller correlation server configurations would provide enough computing power for very large workloads. The SGI Origin 2400 with 16 CPU's represents a oversized configuration for special projects. Even in the context of "Ballistic Fingerprinting" projects, an SGI 2400 would be overdoing it.

6. **Based on your national experience, what is the cold hit rate percentage for the following cartridges:**
   - .25 Auto
   - .380 Auto
   - .38 Special
   - .357 Magnum
   - 9 mm
   - .40 S & W
   - .45 ACP

   **Answer:**
   We dont really keep any other data than the overall number of hits per sites. Most customers keep their own log of hits. We could perform some manual queries on certain databases but the information that we would recover would be incomplete. Let me know if I can provide you with other type of related information. The best information available so far on correlation accuracy was supplied to you in the customer evaluation tests.

7. **How many breach face impressions can be displayed on the DAS ?**

   **Answer:**
   During acquisition only one Breech Face, Firing pin, or Ejector mark can be displayed while within the acquisition section of the IBIS application. During the Analysis stage the user can display anywhere from 1 - 60 images including the reference sample images. In IBIS the user is able to select a specific image type or all images acquired for that sample and then select the number of images to be displayed with the Multiviewer (Tile Screen). From this window the user selects the relevant samples to be viewed in a large side by side comparison viewer that has similar image manipulation to that of a comparison microscope.

8.  **How long does it take to call up a breach face impression?  Is this database dependant?**

    **Answer:**
    The retrieval of images stored on the local database is close to instantaneous (1-2 seconds).

9.  **Assuming New York City has the largest domestic database, can you provide me the following information:**

    - Contact person, phone number and email?
    - Size of the database
    - Test fires specimen size
    - Evidence specimen size
    - Break down by calibers

    **Answer:**
    NYPD has approximately 60,000 cartridge cases and 30,000 bullets.  The database is approximately 85 % Test Fired exhibits and 15 % crime exhibits.  This information is as of September 2000.  Contact would be Michael Boncimino at 718-558- 8715.  The caliber breakdown of the database will follow soon.

10. **What is the status of the BATF-FTI Glock cartridge study?  How many have been entered into the database?**

    **Answer:**
    We are in the last phase of the development of the VSN system.  At Glock, phase 1 and 2 equipment has been installed.  This equipment provides at this point for cartridge case recuperation during test firing activities and automatic acquisition of firing pin and breech face images using the VSN cartridge case automated acquisition system (Also known as the "blue box" or the VSN blue box".  At FTI we are currently building the cartridge case automatic sorting and marking sub-system.  Our engineers and technicians are also working on the optimization of the installed equipment and running preliminary performance test.  We are not entering regularly information in the database as we are concentrating on other elements of the system.  However initial benchmarking data will be tested soon.

11. **Can selected cartridge case images be removed from the database and retained on CD ROM.?  Do these have to be retained in an Oracle format, or can they be retained as TIF images for use at a future date?  I am assuming there is no charge by Oracle for a download, which is just like storing the data, the only charge would be if one were to use Oracle to manipulate the data.**

**Answer:**
At this point in time, archiving of data on an external media such as a CD OM or a ZIP disk is not possible. Some data can be deleted after a proper backup has been performed and restored later for future usage.

**APPENDIX F**


**MODIFICATIONS OF THE BREECH FACE SIGNATURE**

The attached article "Erasing Ballistics Fingerprints: by Bill Twist was published on the Internet by Planet Times.Com.   It illustrates the relative ease one can change the breech face markings.  This change was also performed in Performance test 2.  In this test the CHP S & W Model 4006 had its breech face and firing pin filed in a five-minute operation.

The article is available at:
 http//www.planetimes.com/features/barrel_twist/2000/june/erase.shtml.

# Planet Features TIMES.com

Bill Twist                                                    Barrel Twist Index
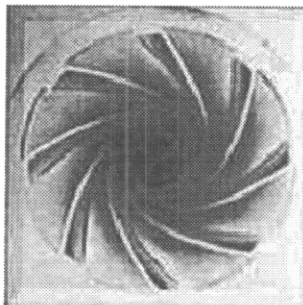


# Barrel Twist

### Erasing Ballistic Fingerprints

Bill Twist
June 28, 2000

As a public service, this weeks column is about some practical matters, and only tangentially political. With the passage of bill S08234 in the New York Senate, and recent information about the formation of the Integrate Ballistic Imaging System (IBIS) being set up by the BATF, I thought some practical information about defeating these systems would be appropriate at this time. I would ask that you print this out and send it to your representatives, state and federal. Tack it up at the local gun shop, and give it out for free at the next gun show.

The first thing to remember is that they can't image or match what they don't have. Guns that spew spent casings, like semi-autos, leave more evidence. This can be overcome, of course, but it requires more work. Also, guns that don't leave rifling marks on the projectiles (like shotguns) can't be matched either. All of these systems work with two principles in mind: rifling leaves identifiable marks on the bullet, and the act of firing leaves identifiable marks on the cartridge case. Unless you use a smoothbore muzzleloader, there is a possibility of tracing either the bullet, the cartridge case, or both.

Let us take rifling marks first. The thing you should understand is that these marks change with wear, rendering any registration of the rifling marks eventually useless. If you want to defeat such a registration system, you must hasten the wear in the barrel. If the gun was entered into a

registration system before you bought it, you have a couple of options. First, if it is a semi-automatic handgun, you could simply buy another barrel. Barrels are uncontrolled, and easily swapped in and out of semi-autos. If you don't want to go to the trouble (or possible paper trail) of buying a new barrel, or if you can't easily change the barrel in your gun, you must change the marks the rifling makes.

You can't change the rifling itself, unless you re-bore the barrel. But you can change the microscopic characteristics of your particular gun. This can be accomplished by soaking a patch in an abrasive and running it up and down the barrel vigorously several times. You can also "fire-lap" the barrel, which is more involved, but just as effective (and more conducive to accuracy). Both of these methods will change the particular "fingerprint" of your barrel. If and when a bullet fired from your barrel is scanned, it will not match any previous sample from your barrel. The most that could be said at that point is that the two samples (one from before you performed the operation, one from after) came from the same caliber and type of gun, but that the two samples don't match.

The other thing you have to worry about is spent cartridge cases. Spent cases are ejected forcefully from semi-automatic firearms, less so from manually operated arms like bolt, lever, and pump actions, and they aren't ejected at all from revolvers. Since we don't have to worry about revolvers, this mostly applies to other firearms (including rifles and shotguns). The firing pin, ejector, extractor, breech face, and chamber all leave unique marks on ammunition cases. All of those parts can be replaced to one degree or another, or modified to change their characteristic tool marks and imperfections.

With firing pins, extractors, and ejectors, the simplest method is to simply buy new ones and replace the old ones. The other method is to take a file to them, and change the characteristic markings. You needn't over do it, just a few passes where they actually come in contact with the case is plenty. The breech face should be polished with some emory cloth, as toolmarks on the breech face can be impressed into the base of the cartridge. The same thing happens with the case walls being impressed into the chamber. This also leaves markings that can be observed and recorded. The chamber can be polished in the same manner as discussed above for the barrel. Don't go overboard, you want to change the markings, not the caliber of your firearm.

There are some general principles to remember. First, they can't match what they don't have. That means not leaving cartridge cases lying around. Shotguns don't leave indentifiable markings on projectiles fired from them. Revolvers don't leave cartridge cases. Manually operated actions can, with care, allow one to retain all fired cartridge cases.

Using bullets made of soft lead, or designed to fragment on impact, reduce the chance that any meaningful comparison can be made, and in some cases may actually frustrate attempts to determine even basic information such as caliber or bullet weight.

Firing from an exceptionally dirty barrel will also change the characteristics, to the point where it is impossible to match bullets fired consecutively. Cartridge cases loaded with black powder (which is exceptionally dirty) and using soft lead bullets in a revolver would give anyone trying to do a ballistic match fits. They won't have cases to work with, and they probably won't get usable rifling marks on the bullet. Even if they do get rifling marks they can use, fouling from the black powder will change the markings from one shot to the next.

So why am I telling you all of this? Well, I have heard IBIS called "ballistic fingerprinting" and "gun DNA". It is neither. You are born with your fingerprints, and your DNA. It is not easy to change your fingerprints, and it is impossible to change your DNA (so far). Changing the marks a firearm makes on bullets and cases is a trivial exercise. Computer matching systems may work, for a little while. You will catch the same stupid people you caught without such a system. You will not catch the people you are trying to catch, the smart ones.

Even without actively trying to defeat such a system, normal wear and tear will eventually make any information recorded when the gun was new useless. Like trigger locks and background checks for private sales, the calls for "ballistic fingerprinting" are a big lie, to appease those who have an ingrained fear of firearms. Unfortunately, the only way to make sure they get the message is to rub their noses in it. Start rubbing.

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Mail Bill Twist

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